

LOAD-BEARING, LIGHTWEIGHT, AND COMPACT SUPER-INSULATION SYSTEM

ABSTRACT OF THE DISCLOSURE

A lightweight and compact super-insulation system that is also capable of supporting a high level of compressive load is described. The system utilizes spacers to provide structural support and utilize controlled buckling of a thin protective outer skin supported by spacers to form strong catenary surfaces to protect insulation material underneath. The spacers may comprise an aerogel, or an aerogel may provide insulation separate from the spacer yet contained within the thin outer skin. The system will be useful for thermal management of variety of deep underwater structures such as pipe-in-pipe apparatus, risers or subsea trees for ultra-deep water oil-and-gas exploration.